ENTRANCE EXAMINATION FOR ADMISSION, MAY 2011.

M.Sc. (BIOINFORMATICS)

COURSE CODE : 378

Register Number :

Signature of the Invigilator
(with date)

COURSE CODE : 378

Time : 2 Hours Max : 400 Marks

Instructions to Candidates :

1. Write your Register Number within the box provided on the top of this page and fill in the page 1 of the answer sheet using pen.
2. Do not write your name anywhere in this booklet or answer sheet. Violation of this entails disqualification.
3. Read each question carefully and shade the relevant answer (A) or (B) or (C) or (D) in the relevant box of the ANSWER SHEET using HB pencil.
4. Avoid blind guessing. A wrong answer will fetch you –1 mark and the correct answer will fetch 4 marks.
5. Do not write anything in the question paper. Use the white sheets attached at the end for rough works.
6. Do not open the question paper until the start signal is given.
7. Do not attempt to answer after stop signal is given. Any such attempt will disqualify your candidature.
8. On stop signal, keep the question paper and the answer sheet on your table and wait for the invigilator to collect them.
9. Use of Calculators, Tables, etc. are prohibited.

1. The primary action of steroid hormones is at the level of

(A) replication
(B) transcription
(C) translation
(D) post transcriptional modification

2. The protein surface tends to be more ———— than the inner core.

(A) hydrophilic
(B) hydrophobic
(C) aromatic
(D) acidic

3. The first complete genome to be sequenced was

(A) *Saccharomyces cerevisiae* chromosome III
(B) *Haemophilus influenza*
(C) PhiX174
(D) The human mitochondrial genome

4. The rate of the first order reaction depends on the

(A) Concentration of the reactant
(B) Concentration of the product
(C) Time
(D) Temperature

5. Most microarray consists of a solid support on which is immobilized

(A) DNA (B) RNA (C) Genes (D) Transcripts

6. Chitin is a

(A) Homopolysaccharide
(B) Heteropolysaccharide
(C) Mucopolysaccharide
(D) Conjugated protein

7. Spider webs are made of the strong and pliable protein called

(A) Fibroin (B) Keratin (C) Chitin (D) Flagellin

8. The major plant hormone auxin causes

(A) Shoot growth and shoot initiation
(B) Splitting of the internode
(C) Cell expansion
(D) Internodal elongation

9. When ΔG of a reaction is negative, the reaction is

(A) At equilibrium
(B) Endergonic and tends to go towards forward reaction
(C) Endergonic and tends to go toward completion
(D) Exergonic and tends to go toward completion

10. Analogous structures are those whose similarity comes from

(A) their performing a similar function, rather than their arising from a common ancestor

(B) their being derived from a common ancestral structure

(C) the wing of a bird and the forelimb of a human

(D) their performing a dissimilar function, rather than their arising from a common ancestor

11. RNAs that catalyze biological reactions, such as self-splicing introns, are known as:

(A) spliceosomes (B) ribozymes (C) ribonucleases (D) m RNAs

12. Which scientists first gave experimental evidence that DNA is the genetic material?

(A) Beadle and Tatum, who used a mutational and biochemical analysis of the bread mold Neurospora to establish a direct link between genes and enzymes

(B) Meselson and Stahl who showed that DNA is replicated semiconservatively

(C) Watson and Crick who gave a model for the structure of DNA

(D) Avery, MacLeod, and McCarty who repeated the transformation experiments of Griffith

13. Actin filaments are found in all of the following except the

(A) Flagella of bacteria (B) Sarcomeres of skeletal muscles cells

(C) Stress fibers of fibroblasts (D) Microvilli of intestinal brush border

14. How does a bacterial cell protect its own DNA from restriction enzymes?

(A) by adding methyl groups to adenines and cytosines

(B) by reinforcing bacterial DNA structure with covalent phosphodiester bonds

(C) adding histones to protect the double-stranded DNA

(D) by forming 'sticky ends' of bacterial DNA to prevent the enzyme from attaching

15. The peptide bond is planar

(A) due to restriction caused by rotation around $c_a - N$ bond

(B) due to restriction around $c_a - c'$ bond

(C) due to delocalization of the lone pair of electrons of the nitrogen onto carbonyl oxygen

(D) because amide protons and carbonyl oxygen are involved in hydrogen bonding.

16. Hydrogen bond length will NOT be

(A) independent of the nature of donor and acceptor atoms.

(B) dependent on donor and acceptor atoms.

(C) dependent on the solvent in which the molecule is dissolved.

(D) dependent on the other atoms bonded with the donor and acceptor

17. Hormone used in the detection of pregnancy in humans is

(A) FSH

(B) Chorionic gonadotropin

(C) Estrogen

(D) Progesteron

18. Enzymes differ from other catalysts in those only enzymes

(A) Are not consumed in the reaction.

(B) Display specificity toward a single reactant

(C) Fail to influence the equilibrium point of the reaction.

(D) Form an activated complex with the reactants.

19. When a muscle is stimulated to contract aerobically, less lactic acid is formed than when it contracts anaerobically because

(A) glycolysis does not occur to significant extent under aerobic conditions.

(B) muscle is metabolically less active under aerobic than anaerobic conditions.

(C) the lactic acid generated is rapidly incorporated into lipids under aerobic conditions.

(D) under aerobic conditions most of the pyruvate generated as a result of glycolysis is oxidized by the citric acid cycle rather than reduced to lactate.

20. Aside from maintaining the integrity of its hereditary material, the most important general metabolic concern of a cell is

(A) Keeping its glucose levels high.

(B) Maintaining a constant supply and concentration of ATP.

(C) Preserving its ability to carry out oxidative phosphorylation.

(D) Protecting its enzymes from rapid degradation

21. The protection against smallpox afforded by prior infection with cowpox represents

(A) antigenic specificity

(B) antigenic cross-reactivity

(C) enhanced viral uptake by macrophages

(D) passive protection

22. What is the difference between RefSeq and GenBank?

(A) RefSeq includes publicly available DNA sequences

(B) GenBank includes non-redundant curated data

(C) GenBank sequences are derived from RefSeq

(D) RefSeq sequences are derived from GenBank

23. The two main features of any phylogenetic tree are the

(A) clades and the nodes

(B) topology and the branch lengths

(C) clades and the root

(D) alignment and the bootstrap

24. The approach that can be used to predict the 3D structure of a protein which has no detectable sequence similarity with the available templates is

(A) homology modeling

(B) comparative modeling

(C) fold recognition

(D) *ab initio* modeling

25. If these were a smaller gravitation effect, then which of the following forces will undergo a change?

(A) Viscous force

(B) Electrostatic force

(C) Magnetic force

(D) Archimedes uplift

26. A bomb at rest suddenly disintegrates into two pieces of equal mass. The fragmented masses will move in

(A) opposite directions with equal speeds

(B) opposite directions with equal velocities

(C) opposite directions with unequal velocities

(D) same direction with same velocity

27. If distance is plotted against x-axis and kinetic energy against y-axis, then the slope of the graph so obtained is proportional to

(A) distance (B) kinetic energy (C) velocity (D) acceleration

28. Which among the following sequences are stop codons?

(A) UAA, UGG, UGA

(B) UUU, UGA, UAA

(C) UGA, UAA, UAG

(D) UAG, UAA, AAG

29. In a population frequency of Al is 0.75 and A2 is 0.25. After one generation the phenotype frequency will be

(A) 0.5625; 0.375; 0.0625

(B) 0.5625; 0.0625; 0.375

(C) 0.750; 0.250; 0.350

(D) 0.5625; 0.1525; 0.0625

30. A group of 212 college students were invited to taste PTC. There were 149 tasters and 63 non-tasters. What is the allele frequencies of T and t?

(A) 0.55; 0.45 (B) 0.25; 0.20 (C) 0.045; 0.055 (D) 0.020; 0.025

31. A rifle bullet weighing 7 g leaves the barrel of a rifle with a velocity of 300 m/s. If the rifle recoils with a velocity of 1 m/s, find the mass of the rifle.

(A) 5.3 kg (B) 2.1 kg (C) 8.1 kg (D) 10 kg

32. What happens when the light intensity incident on a photoelectric surface is doubled?

(A) the frequency of emitted photons is doubled

(B) the number of photons is doubled

(C) the number of photons becomes four times

(D) there is no effect at all

33. The units of the rate constant for the first order reaction could be

(A) $M^{-1}\ min^{-1}$ (B) M (C) $M\ min^{-1}$ (D) min^{-1}

34. The strength of an acid is

(A) directly proportional to the value of the pKa of the acid

(B) inversely proportional to pKa

(C) not related to pKa

(D) equal to 1/pKa

35. Hydrophobic molecules are

(A) generally nonpolar and relatively insoluble in aqueous solutions

(B) generally polar and relatively insoluble in aqueous solutions

(C) generally nonpolar and relatively soluble in aqueous solutions

(D) generally polar and relatively soluble in aqueous solutions

36. Which one of the following statements is NOT TRUE?

(A) Trypsin is an endopeptidase

(B) Trypsin cleaves n-terminus to lysine and arginine

(C) Trypsin exhibits autocatalytic activity

(D) Trypsin is synthesized as inactive zymogen precursor

37. Which chromatography method is based on reversible chemical interactions of high specificity?

(A) reversed phase chromatography

(B) hydrophobic interaction chromatography

(C) gel permeation chromatography

(D) affinity chromatography

38. A file is downloaded to a home computer using a 256 kbps modem connected to an Internet Service Provider. If the download completes in 2 minutes, estimate the maximum size of data downloaded

(A) 3.75 Kb (B) 3.75 MB (C) 3.75 Mb (D) 3.75 KB

39. Insulin promotes

(A) gluconeogenesis (B) glycogenolysis

(C) lipogenesis (D) lipolysis

40. Among the following which hormone can induce flowering in short day plants when grow under longer light duration?

(A) Gibberillic acid (B) Cytokinins

(C) Auxins (D) Acetoactic acid

41. Small non-polar molecules can diffuse across the membrane and do not mostly depend on

(A) Concentration gradient (B) Partition coefficient

(C) Size of the molecules (D) Membrane potential

42. Which is the first step of Glycolysis in which ATP is produced?

(A) Conversion of fructose to fructose-1, 6-bisphosphate

(B) Conversion of 1,3-bisphosphoglycerate to 3-phosphoglycerate

(C) Conversion of phosphoenol pyruvate to pyruvate

(D) Conversion of Glucose to glucose-6-phosphate

43. The coefficient of correlation between two variables is -0.65. This indicates that

(A) a very good direct correlation (B) a fairly good direct correlation

(C) a very good indirect correlation (D) a fairly good indirect correlation

44. Although multiple disulfide bonds are possible during the formation of the tertiary structure of some secretory proteins, only the correct ones are found in the secreted product. This is primarily due to the fact that

(A) incorrectly folded proteins are degraded by lysosomes

(B) processing and folding is continued in the endosomes

(C) protein facilitates the formation of correct disulfide bonds in the endoplasmic reticulum

(D) only correctly folded proteins are translated in the endoplasmic reticulum

45. Tryptophan structure contains which of the following group

(A) Phenol group

(B) Guanidium group

(C) Indole group

(D) Imidazole group

46. Which of the following hormones initiates biological actions by crossing plasma membrane and then binding to receptor?

(A) AGlucagon

(B) Estradiol

(C) Insulin

(D) Norepinephrine

47. The most likely cause for the numerical aberrations of Down's, Turner's and

(A) Klienfielter's syndromes is the fusion of two sperm with one egg to provide an extra set of paternal chromosomes

(B) The occurrence of nondisjunction of homologous chromosomes during meiosis

(C) The selective loss of particular chromosomes from the sex cells after formation of the mature gamete

(D) The abnormal pairing of nonhomologous chromosomes during prophase of meiosis

48. How autophagy necrosis and apoptosis are different?

(A) Autophagy and necrosis are reversible and apoptosis is irreversible

(B) Autophagy necrosis and apoptosis are reversible

(C) Autophagy and necrosis are irreversible and apoptosis is reversible

(D) Autophagy is reversible and necrosis/apoptosis are irreversible

49. Position-specific scoring matrix represents

(A) ungapped alignment

(B) gapped alignment

(C) multiple sequence alignment

(D) local sequence alignment

50. A class contains 10 male and 20 female students, of which half the male and half the female students have blue eyes. What is the Probability p that a student chosen at random is a male or has blue eyes?

(A) 1/6 (B) 2/3 (C) 1/3 (D) 5/6

51. Chromosomal replication in eukaryotes is

(A) Unidirectional (B) Bi directional

(C) Continuous (D) Conservative type

52. Yeast cannot ferment this carbohydrate

(A) Sucrose (B) Glucose (C) Lactose (D) Maltose

53. Fats and Phospholipids are synthesized from

(A) Acetyl CoA & glycerol (B) DNA & RNA

(C) Protein & Amino acids (D) Carbohydrates & Vitamins

54. The type of enzyme known as a phosphoribosyl transferase is involved in

(A) salvage of purine and pyrimidine bases

(B) the de novo synthesis of fatty acids

(C) as a carrier of uridine diphosphate

(D) the de novo synthesis of bile acids

55. A palindrome is a sequence of nucleotides in DNA that

(A) is highly reiterated

(B) is part of the introns of eukaryotic genes

(C) is a structural gene

(D) has local symmetry and may serve as a recognition site for various proteins

56. If distance is plotted against x-axis and kinetic energy against y-axis, then the slope of the graph so obtained is proportional to

(A) distance (B) kinetic energy

(C) velocity (D) acceleration

57. Heat is transmitted from higher to lower temperature through molecular collisions in

(A) viscosity (B) radiation

(C) convention (D) conduction

58. Which one of the following operating systems is not a Multi user operating system?
(A) Windows XP (B) LINUX (C) DOS (D) UNIX

59. The System software that converts the source code written in High level Language into Machine code language is
(A) Assembler (B) Interpreter (C) Compiler (D) Loader

60. Which data structure is called as FIFO?
(A) Graph (B) Heap (C) Stack (D) Queue

61. Which of the following is a service not supported by the operating system?
(A) Protection (B) Accounting (C) Compilation (D) I/O operation

62. Which of the following language is case sensitive?
(A) BASIC (B) COBOL (C) C (D) VB

63. The language which is both a compiler and interpreter is
(A) Perl (B) C++ (C) Java (D) VB

64. C was primarily developed as a
(A) systems programming language (B) general purpose language
(C) data processing language (D) simulation language

65. The minimum number of temporary variables needed to swap the contents of two variables is
(A) 1 (B) 0 (C) 2 (D) 3

66. Literal means
(A) string (B) string constant (C) a character (D) an alphabet

67. The concept of simultaneous execution of many tasks in java is known as
(A) multitasking (B) marshalling
(C) multithreading (D) multiprogramming

68. Which of the following programming language is well suitable for network programming?
(A) C++ (B) Java (C) XML (D) HTML

69. Data members and member functions of a class by default is respectively

(A) private and public (B) public

(C) public and private (D) private

70. Which of the following file retrieval methods use hypermedia?

(A) HTML (B) Veronica (C) WAIS (D) HTTP

71. A process known as ———— is used by large retailers to study trends

(A) Data Selection (B) Data Conversion

(C) Data mining (D) Data integration

72. A messenger RNA is 669 nucleotides long, including the initiator and termination codons. The number of amino acids in the protein translated from this mRNA is

(A) 1998 (B) 222 (C) 223 (D) 333

73. The human genome consists of

(A) more than 45% repeated sequences (B) less than 10% repeated sequences

(C) more than 70% repeated sequences (D) less than 30% repeated sequence

74. Which type of genomics studies the transcripts and proteins expressed by a genome?

(A) comparative genomics (B) functional genomics

(C) subtractive genomics (D) structural genomics

75. The process of changing the form in order to carry out a specialized function is called

(A) differentiation (B) cell division

(C) growth (D) cell elongation

76. The state of a quantum mechanical system is described by

(A) Wave function (B) Radial function

(C) Angular function (D) Time function

77. One atomic unit of length is equal to

(A) 0.52918 A° (B) 0.36182 A° (C) 0.24683 A° (D) 0.28971 A°

78. A ———— Connection provides a dedicated link between two devices

(A) Point-to-point (B) Multipoint (C) Primary (D) Secondary

79. Which of the following is not true about the androgen receptor?

(A) it belongs to the nuclear receptor family

(B) it binds to dehydrotestosterone with more affinity than testosterone

(C) it does not have a transmembrane receptor

(D) it can transduce a cellular signal even without androgen stimulation

80. Insulin promotes

(A) gluconeogenesis (B) glycogenolysis

(C) lipogenesis (D) lipolysis

81. In eukaryotes, transcription of mRNA is (1) catalyzed by what type of enzyme (2) initiated by binding of transcription factors to which important promoter sequence?

(A) RNA polymerase IV; TATA box

(B) RNA polymerase I; Goldberg-Hogness box

(C) RNA polymerase II; TATA box

(D) RNA polymerase III; Goldberg-Hogness box

82. How many domains are there in an immunoglobulin heavy chain constant region?

(A) 2 (B) 3 (C) 6 (D) 5

83. What is the approximate size (in Mb) *of the Caernorhabditis elegans* genome?

(A) 100 Mb (B) 235 Mb (C) 540 Mb (D) 1000 Mb

84. What reagent is used in the Edman degradation of a peptide?

(A) Mercaptoethanol (B) Phenylisothiocyanate

(C) Trifluoroacetic acid (D) Trichloroacetic acid

85. Which of the following is the principal buffer in interstitial fluid?

(A) Hemoglobin (B) Albumin

(C) Carbonic acid (D) H_2PO_4

86. Among the following components of chloroplast membrane which one is the strongest reducing agent?

(A) reduced cytochrome b_6 (B) PQR2

(C) NADPH (D) reduced ferredoxin

87. The growth kinetic that result from metabolizing one sugar before another is referred to as

(A) exponential growth
(B) diphasic growth
(C) diauxic growth
(D) chemotaxis

88. Nucleosome is the functional and structural unit of all chromosomes, it is made up of

(A) RNA + proteins
(B) DNA + proteins
(C) DNA + histone proteins
(D) DNA + RNA + histone proteins

89. When used in a search query the words AND, OR and NOT are capitalized because they are

(A) Common words
(B) Short and easily missed
(C) Boolean operators
(D) Stop words

90. Which of the following is a derived unit?

(A) Mass (B) Length (C) Time (D) Speed

91. When a planet moves around the sun,

(A) the angular momentum remains conserved
(B) the angular speed remains constant
(C) the linear velocity remains constant
(D) the linear momentum remains constant

92. Distance between two parallel planes, $2x + y + 2z = 8$ and $4x + 2y + 4z + 5 = 0$, is

(A) 3/2 (B) 5/2 (C) 7/2 (D) 9/2

93. A child is born with an extra chromosome in each of its cells. This condition is usually the result of

(A) Non-disjunction
(B) Crossing over
(C) Segregation
(D) Hybridization

94. A person standing on the bank of a river observes that the angle of elevation of the top of a tree on the opposite bank of the river is and when he retires 40 meter away from the tree the angle of elevation becomes. The breadth of the river is

(A) 20 m (B) 30 m (C) 40 m (D) 60 m

95. A solid iron sphere A rolls down an inclined plane, while an identical hollow sphere B slides down the plane in a frictionless manner. At the bottom of the inclined plane, the total kinetic energy of sphere A is

(A) less than that of B

(B) equal to that of B

(C) more than that of B

(D) sometimes more and sometimes less

96. When did Watson and Crick publish the helical structure of DNA?

(A) In 1953 (B) In 1954 (C) In 1957 (D) In 1952

97. X-ray crystallography is used to study

(A) structure of lipids

(B) composition of proteins and nucleic acids

(C) arrangement of proteins

(D) three dimensional structure of proteins

98. When pH falls by 1 unit, what is the change in the hydrogen ion concentration?

(A) Increases by 10 times (B) Decreases by 10 times

(C) Increases by 100 times (D) Decreases by 100 times

99. Two bodies of mass m and 3m are thrown vertically upward with the same velocity. On coming back to earth

(A) they will have zero velocity

(B) they will have same velocity

(C) the body of mass 3m will have three times more velocity than that of mass m

(D) the body of mass 3m will have one-third velocity of that of mass m

100. A diesel cycle works at

(A) constant volume (B) constant pressure

(C) constant temperature (D) none of the above